Sleep Medicine 15 (2014) 923–928

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Original Article

Validation of the Sleep Disturbance Scale for Children and prevalence of parent-reported sleep disorder symptoms in Chinese children

Mei-Meng Huang [a], Zhengmin Qian [b], Jing Wang [c], Michael G. Vaughn [d], Yungling Leo Lee [e], Guang-Hui Dong [a,f,*]

[a] Department of Epidemiology and Biostatistics, School of Public Health, China Medical University, Shenyang, China
[b] Department of Epidemiology, College of Public Health and Social Justice, Saint Louis University, Saint Louis, MO, USA
[c] Department of Biostatistics, College of Public Health and Social Justice, Saint Louis University, Saint Louis, MO, USA
[d] Department of Social Work, College of Public Health and Social Justice, Saint Louis University, Saint Louis, MO, USA
[e] Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan
[f] Department of Preventive Medicine, School of Public Health, Sun Yat-sen University, Guangzhou, China

ARTICLE INFO

Article history:
Received 14 October 2013
Received in revised form 31 December 2013
Accepted 24 March 2014
Available online 13 May 2014

Keywords:
Sleep Disturbance Scale for Children
Sleep disorder
Internal consistency reliability
Factor analyses
Elementary school children
Chinese

ABSTRACT

Objective: To translate and validate the Sleep Disturbance Scale for Children (SDSC), a promising questionnaire for use among children in epidemiological studies, in Chinese children.
Methods: In total, 3525 children aged 5–16 years were randomly selected from five primary schools in Shenyang. Internal consistency, reliability and factor analyses were undertaken to assess the construct validity of the SDSC.
Results: Internal consistency indicated adequate reliability (Cronbach's $\alpha = 0.81$). Factor analytic results indicated a six-factor solution (ie, six types of sleep disorder) based on parent-reported sleep disorder symptoms. The mean total score of the SDSC was 39.28 ± 7.83 and 156 (4.43%) children were identified as suffering from parent-reported sleep disorder. The prevalence for each sleep type disorder ranged from 3.46% to 6.30% with the highest for sleep hyperhidrosis (SHY) and the lowest for disorders of initiating and maintaining sleep. Significant differences were found between boys and girls in the prevalence of sleep breathing disorders (6.51% vs 3.72%), SHY (8.62% vs 4.00%) and parent-reported sleep disorders (5.19% vs 3.67%).
Conclusions: The SDSC is reliable and useful in screening for parent-reported sleep disorders in Chinese children. Compared with other countries, parent-reported sleep disorders among Chinese elementary school children were at a relatively low level of prevalence.

1. Introduction

Sleep problems are increasingly being recognized as an important aspect of public health worldwide [1], especially for children who require more sleep than adults but frequently get less sleep than they need [2]. In children, adequate sleep not only plays an important role in childhood development and but also has significant effects on their health [3]. Evidence shows that inadequate sleep in children has been shown to be associated with poor academic performance, behavioral problems, poor mental and physical health, alcohol use, accidents, and injuries [4–13]. Furthermore, sleep problems are becoming increasingly prevalent in children in recent years. A recent study reported that the proportion of US children age 6–17 years with <7 days/week of adequate sleep increased markedly from 31.2% in 2003 to 41.9% in 2012 [14].

According to the International Classification of Sleep Disorders, Diagnostic and coding manual, sleep disorders include eight different categories: insomnias, sleep-related breathing disorders, hypersomnias, circadian rhythm disorders, parasomnias, sleep-related movement disorders, isolated symptoms/normal variants/unresolved issues, as well as other sleep disorders [15]. Although polysomnography is often used as the gold standard for diagnosing sleep disorders in laboratory research [16,17], this method has severe limitations in large epidemiological investigations due to the time and effort required and the costs of laboratory research. Questionnaires are a useful screening tool, as they not only make it possible for the proposed measurements to be standardized,

* Corresponding author at: Department of Epidemiology and Biostatistics, School of Publich Health, China Medical University, 92 North 2nd Road, Heping District, Shenyang 110001, China; and Department of Preventive Medicine, School of Public Health, Sun Yat-sen University, 74 Zhongshan 2nd Road, Yuexiu District, Guangzhou 510080, China. Tel.: +86 20 87333409; fax: +86 20 87330446.
E-mail addresses: donggh5@mail.sysu.edu.cn, donggh512@hotmail.com (G.-H. Dong).

http://dx.doi.org/10.1016/j.sleep.2014.03.023
1389-9457/

uniform, and reproducible but also are easily and quickly applied in large-sample epidemiological studies. To access data on the presence of sleep disorders, various questionnaires have been designed to measure sleep disturbances among children [18], and results have reported that the overall prevalence of parent-reported sleep disorders in children ranges considerably from 3% to 94% [4,16,19–23]. Such wide range prevalence for sleep disorders may be due to differing definitions of sleep disorders, questionnaires, and different characteristics of the populations in these studies. In order to permit direct comparisons, it is necessary to develop an international standard questionnaire for the definition of sleep disorders that can be utilized across studies. One promising instrument, the Sleep Disturbance Scale for Children (SDSC) questionnaire, contains many important sleep disorder items that may be present in school-aged children. The 26-item SDSC has been widely used in western countries [6,16,24–26], and has only been employed in Asian populations for one study conducted in Malaysia [27]. The SDSC has been shown to be a useful tool to screen for parent-reported symptoms of sleep disorder in school children and preschool-age children in Italy [16], as well as the sleep breathing disorders (SBD) subscale of SDSC for Brazilian children [17].

In the last 20 years, there has been a large number of studies on sleep disorders in children in the literature but only limited epidemiological research has accrued in Chinese children. As a developing country, China varies greatly from developed countries in social demography and economic status that may make Chinese children' sleep characteristics different from their peers in other countries. The aims of the present study were to translate and assess the reliability and validity of the SDSC in Chinese and examine the sleep patterns and prevalence of sleep disorder symptoms in Chinese primary school children. The purpose, research questions, modification tools, translation, pilot study, reliability, validity, confirmatory analyses, standardization, and development norms of the scale must be taken into consideration in developing a questionnaire [28]. Based on previous studies, we expected that the Chinese version of the SDSC may prove useful for identifying children with parent-reported symptoms of sleep disorder.

2. Methods

2.1. Procedure

Shenyang is located in Northeast China, with a population of 7.9 million as of 2010 and five urban districts. In August 2012, we conducted a cross-sectional survey in which we randomly selected one elementary school from each of the five districts. All of the children from the five schools were recruited for this study according to the following selection criteria: (i) subjects must have lived in the district for at least two years prior to the selection; and (ii) subjects must be aged 5–16 years according to the suitable age range for the SDSC. This resulted in 4250 selected children being included in the final sample. The aims of this study were explained to the teachers of the selected schools. After agreeing to written parental consent, parents were invited to a parents' meeting to learn detailed information about the survey, including the objectives of the survey and instructions on filling out the questionnaire. Parents who wished to participate took the questionnaire home, completed and then returned it (via child) to the teacher in an envelope. All questionnaire responses were recorded electronically in a database using a standardized code and file structure. This study was approved by the Ethics Committee of China Medical University.

2.2. Instrument

The SDSC was originally validated in a sample of Italian children aged 6–16 years by Bruni et al. [16]. The questionnaire was translated using forward translations and back translations. Using forward translation, the English version of SDSC was translated to Chinese by two translators (working independently) who were fluent in Chinese and English. Their translations were then reviewed and compared by three sleep specialists until a consensus was reached on the translated questionnaire. Using back translation, this translated questionnaire was translated back to English by another two bilingual translators. Their translations were reviewed and compared by the three sleep specialists until a consensus was reached, leading to the final Chinese version of the questionnaire. Finally, among the 26 questions that were designed for parents, those that were not fully understood by $\geqslant$20% (n = 5) of the parent participants were revised accordingly until they were understood by all parents.

The SDSC provides a total score based on 26 items related to sleeping over six months and the degree of sleep disorder symptoms was assessed by the SDSC total score [16]. The SDSC contains two items assessing the sleep quality using a five-point scale [for total sleep time from 1 (9–11 h) to 5 (<5 h) and for latency to sleep onset from 1 (<15 min) to 5 (>60 min)] and 24 items assessing the frequency of sleep disorder symptoms which were also measured on a Likert-type five-point scale: 1, never; 2, occasionally (once or twice a month); 3, sometimes (once or twice a week); 4, often (three to five times a week); 5, always (six or seven times a week). The SDSC also identifies six types of sleep disorder symptoms in children: disorders of initiating and maintaining sleep (DIMS, eg, sleep duration, sleep latency, night awakenings, and anxiety falling asleep), sleep breathing disorders (SBD, eg, snoring and breathing problems), disorders of arousal (DA, eg, sleepwalking, sleep terrors, and nightmares), sleep–wake transition disorders (SWTD, eg, rhythmic movements, hypnic jerks, sleep talking, and bruxism), disorders of excessive somnolence (DOES, eg, difficulty waking up, morning tiredness, and inappropriate napping) and sleep hyperhidrosis (SHY, eg, nocturnal sweating). A total score and six factor scores were then calculated for each child. The higher the score, the greater the risk of children suffering sleep disorders. The scores can then be converted to a T-score enabling the comparison between the child's total and factor scores. The converted formula is as follows:

$$T\text{-score} = 50 + (\text{value} - \text{mean})/\text{standard deviation} \times 10$$

A child with T-score >70 was considered to have symptoms of sleep disorder. In addition to the SDSC, data were also gathered on the child's age, sex, height, weight, homework load, years of residence, the parents' level of education, and so on.

2.3. Statistical analysis

Cronbach's α, which provides a measure of the internal consistency, was performed to estimate the reliability of the SDSC. Structure of the SDSC was tested by the use of factor analysis employing varimax rotation procedures. Group differences in the prevalence of parent-reported sleep disorder symptoms between boys and girls were analyzed using the χ^2-test. All statistical analyses were conducted using SAS 9.2 (SAS Institute Inc., Cary, NC, USA) and $P < 0.05$ was considered significant.

3. Results

From April 2011 to June 2011, 4250 children from the randomly selected primary schools in the five districts of Shenyang participated in the study. The returned questionnaires without missing response from 3525 children, including 1752 boys (49.70%) were used in the analysis, resulting in an effective response rate of

82.94%. The mean age of the children was 9.61 ± 1.69 years, ranging from 6.37 to 13.45 years.

3.1. Reliability of the scale

Internal consistency reliability tests indicated good reliability for the total score ($\alpha = 0.81$). As shown in Table 1, the internal consistency of all the subscales except the SBD and DA subscales had $\alpha > 0.6$. The item–total correlation analysis (Table 2) reveals that the correlation coefficients of four items (1, 2, 11, 17) were $\rho < 0.3$ in the item–total correlation matrix. No significant substantial change in Cronbach's α was observed after the removal of each item, and therefore all four items were retained.

3.2. Factor analysis

A seven-factor solution based on the eigenvalues was suggested, accounting for 48.64% of the total variance. However, both the experimental test [16,29] and the screen plot suggested that a six-factor solution, accounting for 44.64% of the total variance, was more interpretive and conceptually appropriate for the study. The result of factor analysis (Table 3) indicates that 25 items had a factor load >0.4, but item 1 loaded a score <0.4 (0.37) on factor 2.

With the exception of factors 2 and 4, the other factors were consistent with those from the original factor analysis of the SDSC [16]. For example, factor 1 was defined by six items related to abnormal movements in bed and therefore was classified as SWTD. Similarly, factor 3 reflected the difficulty in getting up and sleeping on daytime and therefore was classified as DOES. Factor 5 was defined by two items related to sweating at night and therefore was classified as SHY. Factor 6 was defined by three sleep-disorder breathing items and therefore was classified as SBD. Some adjustments were made in factors DA and DIMS. Factor 2 was defined by items related to sleep duration, sleep latency, and the problems in falling asleep, and therefore was classified as DIMS. Items 10 and 11 related to awakening at night have higher factor loading in factor 4 than in factor 2 and were classified as DA along with items 17, 20 and 21.

To validate our factor analytic findings, we performed a cross-validation design in which we randomly split the sample (all cases) in halves (training and validation), since our data were sufficiently extensive (with 3525 observations), performing factor analysis on both sets of data and comparing the two solutions. Results showed that factor analysis assigned the same items to each scale for both sets of data. For example, loadings of items 6–8, 12, 18 and 19 assigned to factor SWTD were similar for both training and validation data (highlighted in red); loadings of items 1–5, 10, 11, 17, 20 and 21 assigned to factor DA and DIMS were similar for both training and validation data; loadings of items 22–26 assigned to factor DOES were similar for both training and validation data; loadings of items 9 and 16 assigned to factor SHY were similar for both training and validation data; loadings of items 13–15 assigned to factor SBD were similar for both training and validation data, which confirmed our findings of factor analysis. Supplementary Table A in the Appendix shows the summary of the cross-validation results.

Table 1
Cronbach's α for the Sleep Disturbance Scale for Children and its subscales.

Element	No. of items	Cronbach's α
Scale	26	0.81
Subscale DIMS	7	0.60
Subscale SBD	3	0.49
Subscale DA	3	0.49
Subscale SWTD	6	0.62
Subscale DOES	5	0.61
Subscale SHY	2	0.71
The subscale	6	0.69

DIMS, disorders of initiating and maintaining sleep; SBD, sleep breathing disorders; DA, disorders of arousal; SWTD, sleep–wake transition disorders; DOES, disorders of excessive somnolence; SHY, sleep hyperhidrosis.

Table 2
Item–total correlation analysis of Sleep Disturbance Scale for Children.

Item	Item–total correlation (Spearman's ρ)	Cronbach's α if deleted
1	0.19	0.81
2	0.27	0.81
3	0.49	0.80
4	0.46	0.80
5	0.45	0.80
6	0.42	0.80
7	0.50	0.80
8	0.50	0.80
9	0.50	0.80
10	0.36	0.80
11	0.26	0.81
12	0.55	0.80
13	0.33	0.80
14	0.32	0.81
15	0.40	0.80
16	0.42	0.80
17	0.19	0.81
18	0.44	0.80
19	0.35	0.81
20	0.34	0.80
21	0.43	0.80
22	0.52	0.80
23	0.51	0.80
24	0.30	0.81
25	0.40	0.80
26	0.32	0.81

The correlations between factors are shown in Table 4. The Spearman correlation coefficients between the total score and factors SWTD and DOES were the highest (0.79 and 0.69, respectively) whereas the factors SHY and SBD showed the lowest correlation ($\rho = 0.54$). The correlation coefficients between the factors were all <0.4 ($P < 0.001$).

3.3. Prevalence of sleep problems

The survey response from parents showed that most of the primary school children (90.33%) slept >8 h per night and that 0.65% slept <7 h; 4.23% of the children fell asleep 30 min after going to bed. The frequencies of parent-reported sleeping disorders are presented in Table 5. The subscale scores were also calculated as the sum of the included item scores. The average SDSC total score was 39.28 ± 7.83 and 156 (4.43%) children suffered from symptoms of sleep disorder. There were differences in prevalence of the six types of parent-reported sleep disorder symptoms, with the highest in SHY (6.30%) and the lowest in DIMS (3.46%). With respect to gender, significant differences in the prevalence of SBD, SHY, and parent-reported sleep disorder symptoms were found.

4. Discussion

According to the study data, the SDSC is a useful instrument for screening sleep disturbances in Chinese primary school children. The SDSC presents higher internal consistency ($\alpha = 0.81$) than the original Italian study [16] and is similar to the results from the Italian pre-school children [30] and Arabic children aged 6–13 years [17]. Cronbach's α for the SBD and DA subscales was <0.6, similar to the results in the Simola study [29].

The factor analysis results in the present study demonstrated convergent validity to the original study [16]. Item 10 and item

Table 3
Factors for the Sleep Disturbance Scale for Children.

Items	Variance explained (%)	Factor loading
Factor 1: sleep wake transition disorders	18.02	
6: hypnic jerks		0.40
7: rhythmic movement disorders		0.45
8: hypnagogic hallucinations		0.42
12: nocturnal hyperkinesias		0.62
18: sleep talking		0.65
19: bruxism		0.45
Factor 2: disorders of initiating and maintaining sleep	6.36	
1: sleep duration		0.37
2: sleep latency		0.69
3: going to bed reluctantly		0.59
4: difficulty in falling asleep		0.76
5: falling asleep anxiety		0.41
Factor 3: disorders of excessive somnolence	5.78	
22: difficulty in waking up		0.62
23: tired when waking up		0.68
24: sleep paralysis		0.57
25: daytime somnolence		0.54
26: sleep attacks		0.56
Factor 4: disorders of arousal nightmares	5.32	
10: night awakenings		0.41
11: difficulty in falling asleep after awakenings		0.51
17: sleepwalking		0.60
20: sleep terrors		0.59
21: nightmares		0.52
Factor 5: sleep hyperhidrosis	4.77	
9: falling asleep sweating		0.82
16: night sweating		0.85
Factor 6: sleep breathing disorders	4.40	
13: breathing problems		0.70
14: sleep apnea		0.77
15: snoring		0.44
Total variance explained	44.64	

Table 4
Spearman correlation coefficients (ρ) between factors.

	Total score	SWTD	DIMS	DOES	DA	SHY
SWTD	0.79					
DIMS	0.64	0.34				
DOES	0.69	0.40	0.35			
DA	0.56	0.36	0.28	0.32		
SHY	0.54	0.38	0.22	0.26	0.26	
SBD	0.51	0.36	0.19	0.27	0.25	0.30

SWTD, sleep–wake transition disorders; DIMS, disorders of initiating and maintaining sleep; DOES, disorders of excessive somnolence; DA, disorders of arousal; SHY, sleep hyperhidrosis; SBD, sleep breathing disorders.
$P < 0.001$ for all.

11 had higher factor loadings on factor 4, whereas in the original study DIMS had higher factor loadings. This may be due in part to these two items and items 17, 20 and 21 being related to the child's sleep at midnight, whereas items 3–5 are related to the bedtime activities. A further reason may be the different amount of parental attention at midnight and bedtime. The factor–total and factor–factor correlation coefficients were significant, indicating that the six factors of SDSC are not independent but are interrelated. The SWTD has the highest Spearman correlation coefficients with the other factors as it is the main factor in the total score. Overall, we found that the SDSC is acceptable for screening for sleep problems in Chinese children.

The mean total score for the children in this study was 39.28 with a standard deviation of 7.83, similar to the children (39.67 ± 11.33) in the Italian study's control group aged 7–12 years

Table 5
The Sleep Disturbance Scale for Children factor scores and the prevalence of sleep disorder symptoms in Chinese primary school children.

	Factor scores (mean ± SD)	*T*-score >70		
		Male	Female	Total
SWTD	10.59 ± 2.98	68 (3.88%)	70 (3.95%)	138 (3.91%)
DIMS	10.86 ± 2.62	65 (3.71%)	57 (3.21%)	122 (3.46%)
DOES	7.24 ± 2.32	111 (6.34%)	90 (5.08%)	201 (5.70%)
DA	3.63 ± 1.03	111 (6.34%)	86 (4.85%)	197 (5.59%)
SHY	2.99 ± 1.39	151 (8.62%)	71 (4.00%)**	222 (6.30%)
SBD	3.97 ± 1.35	114 (6.51%)	66 (3.72%)**	180 (5.11%)
Total score	39.28 ± 7.83	91 (5.19%)	65 (3.67%)*	156 (4.43%)

SWTD, sleep–wake transition disorders; DIMS, disorders of initiating and maintaining sleep; DOES, disorders of excessive somnolence; DA, disorders of arousal; SHY, sleep hyperhidrosis; SBD, sleep breathing disorders.
Difference of sleep disorder prevalence between males and females.
* $P < 0.05$.
** $P < 0.01$.

[31]. Sleep disorder has been defined in different ways and therefore we made comparison to the studies that used the same questionnaire. The prevalence of sleep disorder (4.43%) from our study was close to the report in the Italian school-age children (4.19%) [18] and lower than the prevalence in Australian (10.00%) [20], Egyptian (24.30%) [19] and Finnish (26.70%) [8] children.

The transition to an earlier school start time, along with sleep phase delay, significantly affects children's sleep quality, sleep–wake schedule, and daytime activities. Intervention research has reported that the sleep duration and daytime sleepiness of children were improved significantly after delaying school start time 30 and 60 min, respectively [32]. The owning of electronic appliances [4], the surrounding environment in which children live [14], parental factors [33], or some chronic diseases [20,34] may lead to the prevalence of sleep disorder in children.

The children in the study presented six types of sleep disorder symptoms according to the SDSC, with 3.91% for SWTD, 3.46% for DIMS, 5.70% for DOES, 5.59% for DA, 6.30% for SHY, and 5.11% for SBD, which were lower than in the study on the children of the same age in Egypt [19], Australia [20], Italy [18], and Switzerland [35]. The difference in the prevalence between China and other countries could be explained in part by the cultural difference, the progress made on reducing homework load on children in China, the lack of awareness of sleep disorders among parents of the children, and the Chinese parents underestimating the sleep disorders in their children [24].

The prevalence of the six types of sleep disorder symptoms varied by sex; boys aged 6–14 years had a higher prevalence of parent-reported sleep disorder symptoms (5.19%) than girls (3.67%) of the same age. This concurred with Potasz's study [36]. However, such a difference was not observed in children aged 8 years in another study [33]. The inconsistency may be due to cultural differences between countries [37]. On the other hand, the gender difference in prevalence of sleep breathing disorders is consistent with a study reporting a higher prevalence of SBD in boys aged 6–10 years than in girls of the same age [38]. Our results also showed a significant gender difference in prevalence of SHY. Further research may be warranted to examine the gender effect on sleep quality.

This study also has several limitations. The study used data reported by parents and therefore had a potential for recall bias that may have lower accuracy than objective methods such as actigraphy or polysomnography. In other words, the SDSC cannot be used for clinical diagnosis. The parents may underestimate the sleep disturbance on their child due to the lack of awareness of some sleep disorder symptoms [24]. Furthermore, the discriminatory validity, sensitivity, and specificity of the SDSC have not been

calculated due to the lack of sleep disorder patients in this study. Finally, the classification of sleep disorder symptoms in factor analysis was restricted to the previous disease classification system (ASDC, 1979) rather than to the new one (ICSD-2, 2005), as the former was more adaptable to children and more clinical in approach. Nonetheless, this study provides some guidelines on using the SDSC questionnaire on Chinese children and comparing parent-reported symptoms of sleep disorder in Chinese children with those from other countries. The ease of administration, scoring, and interpretation of the SDSC also made it possible for practitioners to evaluate potential sleep-related problems and to address sleep disorder prevention.

5. Conclusions

Children sleep less than they did one century ago [2] and sleep disorders in children are related to a host of social, cultural, familial factors [1,39] and environmental factors [19]. Further research is needed to investigate these factors and take effective measures for sleep disturbance prevention. In addition, standardized sleep questionnaires are needed that can be used globally. Evaluating the validity and applicability of such questionnaires is a necessary step in establishing the universality in the epidemiology of sleep disorders. The present study is just one step by finding preliminary support for the validity of the SDSC in Chinese children.

Funding source

This work was supported by grants from the China Environmental Protection Foundation (CEPF2008-123-1-5, CEPF2011-123-2-7).

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: http://dx.doi.org/10.1016/j.sleep.2014.03.023.

Acknowledgments

The authors acknowledge the cooperation of the seven cities, school principals, teachers, and students and their parents.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.sleep.2014.03.023.

References

[1] Colten HR, Altevogt BM, editors. Sleep disorders and sleep deprivation: an unmet public health problem. Institute of Medicine (US) Committee on Sleep Medicine and Research. Washington, DC: National Academies Press; 2006.
[2] Matricciani LA, Olds TS, Blunden S, Rigney G, Williams MT. Never enough sleep: a brief history of sleep recommendations for children. Pediatrics 2012;129:548–56.
[3] Jenni OG, Molinari L, Caflisch JA, Largo RH. Sleep duration from ages 1 to 10 years: variability and stability in comparison with growth. Pediatrics 2007;120:e769–76.
[4] Chahal H, Fung C, Kuhle S, Veugelers PJ. Availability and night-time use of electronic entertainment and communication devices are associated with short sleep duration and obesity among Canadian children. Pediatr Obes 2013;8:42–51.
[5] Calamaro CJ, Mason Thornton BA, Ratcliffe SJ. Adolescents living the 24/7 lifestyle: effects of caffeine and technology on sleep duration and daytime functioning. Pediatrics 2009;123:e1005–10.
[6] Paavonen EJ, Porkka-Heiskanen T, Lahikainen AR. Sleep quality, duration and behavioral symptoms among 5–6-year-old children. Eur Child Adolesc Psychiatry 2009;18:747–54.
[7] Lin JD, Tung HJ, Hsieh YH, Lin FG. Interactive effects of delayed bedtime and family-associated factors on depression in elementary school children. Res Dev Disabil 2011;32:2036–44.
[8] Paavonen EJ, Raikkonen K, Pesonen AK, Lahti J, Komsi N, Heinonen K, et al. Sleep quality and cognitive performance in 8-year-old children. Sleep Med 2010;11:386–92.
[9] Camfferman D, Kennedy JD, Gold M, Simpson C, Lushington K. Sleep and neurocognitive functioning in children with eczema. Int J Psychophysiol 2013;1:6–13.
[10] Daniel LC, Boergers J, Kopel SJ, Koinis-Mitchell D. Missed sleep and asthma morbidity in urban children. Ann Allergy Asthma Immunol 2012;109:41–6.
[11] Brockmann PE, Bertrand P, Pardo T, Cerda J, Reyes B, Holmgren NL. Prevalence of habitual snoring and associated neurocognitive consequences among Chilean school aged children. Int J Pediatr Otorhinolaryngol 2012;76:1327–31.
[12] Ng EP, Ng GK, Chan CH. Sleep duration, wake/sleep symptoms, and academic performance in Hong Kong secondary school children. Sleep Breath 2009;13:357–67.
[13] Paavonen EJ, Raikkonen K, Lahti J, Komsi N, Heinonen K, Pesonen AK, et al. Short sleep duration and behavioral symptoms of attention-deficit/hyperactivity disorder in healthy 7–8-year-old children. Pediatrics 2009;123:e857–64.
[14] Singh GK, Kenney MK. Rising prevalence and neighborhood, social, and behavioral determinants of sleep problems in US children and adolescents, 2003–2012. Sleep Disord 2013;2013:394320.
[15] Narang I, Manlhiot C, Davies-Shaw J, Gibson D, Chahal N, Stearne K, et al. Sleep disturbance and cardiovascular risk in adolescents. Can Med Assoc J 2012;184:e913–8.
[16] Bruni O, Ottaviano S, Guidetti V, Romoli M, Innocenzi M, Cortesi F, et al. The Sleep Disturbance Scale for Children (SDSC). Construction and validation of an instrument to evaluate sleep disturbances in childhood and adolescence. J Sleep Res 1996;5:251–61.
[17] Lomelí HA, Pérez-Olmos I, Talero-Gutiérrez C, Moreno CB, González-Reyes R, Palacios L, et al. Sleep evaluation scales and questionnaires – a review. Actas Esp Psiquiatr 2008;36:50–9.
[18] Esposito M, Roccella M, Parisi L, Gallai B, Carotenuto M. Hypersomnia in children affected by migraine without aura: a questionnaire-based case–control study. Neuropsychiatr Dis Treat 2013;9:289–94.
[19] Maha K. Abou-Khadra. Association between PM(10) exposure and sleep of Egyptian school children. Sleep Breath 2013;17:653–7.
[20] Camfferman D, Kennedy JD, Gold M, Martin AJ, Winwood P, Lushington K. Eczema, sleep, and behavior in children. J Clin Sleep Med 2010;6:581–7.
[21] Esposito M, Gallai B, Roccella M, Marotta R, Lavano SM, et al. Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. Neuropsychiatr Dis Treat 2013;9:437–43.
[22] Gau SS-F. Prevalence of sleep problems and their association with inattention hyperactivity among children aged 6–15 in Taiwan. J Sleep Res 2006;15:403–12.
[23] Sheares BJ, Kattan M, Leu CS, Lamm CI, Dorsey KB, Evans D. Sleep problems in urban, minority, early-school-aged children more prevalent than previously recognized. Clin Pediatr 2013;52:302–9.
[24] Roeser K, Eichholz R, Schwerdtle B, Schlarb AA, Kübler A. Relationship of sleep quality and health-related quality of life in adolescents according to self- and proxy ratings: a questionnaire survey. Front Psychiatry 2012;3:76–81.
[25] Mol EM, Monbaliu E, Ven M, Vergote M, Prinzie P. The use of night orthoses in cerebral palsy treatment: sleep disturbance in children and parental burden or not? Res Dev Disabil 2012;33:341–9.
[26] Ong LC, Yang WW, Wong SW, AlSiddiq F, Khu YS. Sleep habits and disturbances in Malaysian children with epilepsy. J Pediatr Child Health 2010;46:80–4.
[27] Ferreira VR, Carvalho LB, Ruotolo F, de Morais JF, Prado LB, Prado GF. Sleep Disturbance Scale for Children: translation, cultural adaptation, and validation. Sleep Med 2009;10:457–63.
[28] Spruyt K, Gozal D. Development of pediatric sleep questionnaires as diagnostic or epidemiological tools: a brief review of do's and don'ts. Sleep Med Rev 2011;15:7–17.
[29] Simola P, Niskakangas M, Liukkonen K, Virkkula P, Pitkäranta A, Kirjavainen T, et al. Sleep problems and daytime tiredness in Finnish preschool-aged children – a community survey. Child Care Health Dev 2010;36:805–11.
[30] Romeo DM, Bruni O, Brogna C, Ferri R, Galluccio C, De Clemente V, et al. Application of the Sleep Disturbance Scale for Children (SDSC) in preschool age. Eur J Pediatr Neurol 2013;17:374–82.
[31] Carotenuto M, Esposito M, Pascotto A. Facial patterns and primary nocturnal enuresis in children. Sleep Breath 2011;15:221–7.
[32] Li SH, Arguelles L, Jiang F, Chen W, Jin X, Yan C, et al. Sleep, school performance, and a school-based intervention among school-aged children: a sleep series study in China. PLoS One 2013;8:e67928–31.
[33] Pesonen AK, Raiikkonen K, Matthews K, Heinonen K, Paavonen JE, Lahti J, et al. Prenatal origins of poor sleep in children. Sleep 2009;32:1086–92.
[34] Hysing M, Sivertsen B, Stormark KM, Elgen I, Lundervold AJ. Sleep in children with chronic illness, and the relation to emotional and behavioral problems – a population-based study. J Pediatr Psychol 2009;34:655–6.

[35] Bloetzer C, Jeannet PY, Lynch B, Newman CJ. Sleep disorders in boys with Duchenne muscular dystrophy. Acta Paediatr 2012;101:1265–9.
[36] Potasz C, Juliano ML, Varela MJ, Ferraz PG, Carvalho LB, Prado LF, et al. Prevalence of sleep disorders in children of a public hospital in São Paulo. Arq Neuropsiquiatr 2010;68:235–6.
[37] Steptoe A, Peacey V, Wardle J. Sleep duration and health in young adults. Arch Intern Med 2006;166:1689–92.
[38] Abdullah AAF, Jamalludin AR, Norrashidah AW, Norzila MZ, Asiah Kassim K, Rus Anida A, et al. Prevalence of sleep disordered breathing symptoms among Malay school children in a primary school in Malaysia. Med J Malaysia 2012;67:181–5.
[39] Siomos KE, Avagianou PA, Floros GD, Skenteris N, Mouzas OD, Theodorou K, et al. Psychosocial correlates of insomnia in an adolescent population. Child Psychiatry Hum Dev 2010;41:262–73.